

## **I. Executive Summary**

The principal objective of this assignment is to provide guidance to the Board of Directors and management of Swaziland Railway (SR) on whether to lease or purchase locomotives. A secondary objective is to assess the need for SR to expand its in-house maintenance capability and to improve its maintenance procedures. The project team consisted of Edgar C. Harrell, Team Leader and Senior Financial Analyst, and John Craik, Senior Railway Engineer. The team visited Swaziland from May 9-May 19 and met with senior South African Railway officials on May 19 in Johannesburg.

The principal variables that affect the decision to buy or lease locomotives are:

- C availability of locomotives to haul freight
- C the initial cost of the locomotives, which is related to availability - more locomotives or better maintenance results in higher probability of having locomotives available to haul freight and to whether SR buys new or used locomotives
- C the terms of financing the purchase
- C the cost of maintenance which is related to a decision on investing in an expanded in-house capability or contracting the maintenance out
- C the escalation, if any, in the cost of the existing lease arrangement with Spoornet
- C the discount rate assumed as the required rate of return for SR or an investor in SR.

Some of these variables are quantifiable and can be estimated, e.g., the cost of new and used locomotives and the cost of maintenance, while others, e.g., the escalation in the terms of the lease with Spoornet and the required rate of return on capital for SR are quantifiable and difficult to estimate with precision. Underlying, but not included in the least cost analysis, are the potential foreign exchange risk to SR in purchasing locomotives - the Lilangeni has devalued an average of 5.7% per year against the US dollar since 1989 - and the potential for traffic diversification to Mozambican ports.

The least-cost analysis relies on several key variables, including

- C locomotive availability
- C cost of locomotives -new and used
- C cost of maintenance
- C interest rate on financing
- C discount rate



Results show that the current lease arrangement is consistently a lower cost option for SR than purchasing locomotives unless:

1. SR purchases used locomotives,
2. the terms of financing provided by the Government of Swaziland to SR for such purchases are on a grant or grant equivalent basis (i.e., 1% annual interest rate)
3. maintenance of locomotives is contracted out,
4. Spoornet raises its current leasing fees by at least 20% in real terms in 1997/98, **and**
5. the required rate of return on capital to SR (or an investor in SR) is less than 14%.

The results of this analysis are summarized in Table 1. Annex 5 provides a draft prospectus or invitation for bids which might be used to test the market for the price of used locomotives, cost of contract maintenance, and terms available for financing.

Current market conditions suggest that it is unlikely that Spoornet will raise its lease fees substantially given the availability of locomotives for lease and purchase not only in South Africa but also in Zambia, Namibia, Zimbabwe and Malawi. Even if all these unlikely events were to occur simultaneously, other disadvantages of SR purchasing locomotives, in addition to the higher cost relative to leasing, the uncertainty of changes in freight traffic through Swaziland due to the reopening of port facilities in Mozambique and the absence of a market for locomotives should demand for SR services decrease substantially. Again, at the present time, almost all countries in the region have excess locomotives.

For SR to undertake its own maintenance would require an investment of about \$1.8 million in equipment and expanded facilities as well as extensive training of staff. Railroad engineering departments across Africa struggle to achieve 60% availability even with massive injections of technical assistance. This compares with the almost 100% availability SR enjoys under its present arrangements. With only 60% availability SR must make substantially greater investments in locomotives to carry the freight it is now carrying under a leasing agreement. It would also have to increase the freight it now carries by almost 1 million NT to break even. However, whether SR purchases or leases locomotives in the future, contracting out the maintenance to a third party and including a guarantee of availability is strongly recommended. It is also recommended that SR negotiate a long term traffic agreement with Spoornet specifying a minimum number of days per year, hours per day, or tons of freight that Spoornet will ship over the corridor annually. This is particularly important if SR decides to lease locomotives from a country other than South Africa. Furthermore, it is also recommended that SR keep up to date records for each class of locomotive on utilization, (measured by kilometers or engine hours), and failures in traffic and reliability (measured in terms of mean time between failures and



calculated on a moving average basis). This information will improve SR's ability to manage any leasing or maintenance contract and allow for claiming compensation if reliability falls below an agreed upon standard.

There may be some cost savings and improved utilization and benefits if SR uses shunter or trip locomotives in lieu of mainline locomotives in certain locations. SR may also be able to leave open the option of purchasing its own locomotives should future demand warrant by negotiating a lease arrangement with Spoornet or TransNamib with an option to purchase at some fixed price. SR could also enhance its corporate identity by painting the locomotives with the SR logo and colors.

Meetings with TransTrade (the international marketing group for Transnet, the parent company of Spoornet) in Johannesburg suggested that the South Africans want to continue to work with SR and are open to any kind of arrangement that makes economic sense. Such arrangements could include leasing, leasing with an option to purchase, purchasing, contract maintenance, contract maintenance with a guarantee of availability, among others. Working with TransTrade rather than Spoornet has some advantages for SR since an annual transaction of E5-10 million represents a major piece of business to TransTrade whereas it is insignificant to Spoornet. TransTrade negotiated the recent leasing and maintenance agreement between Spoornet and Kenya Railways. It is also clear that TransNamib and others would be interested in discussing a lease or purchase agreement with SR.

SR is a well-run railway company. It has made tremendous progress in becoming self-sufficient and competitive in the last five years. This positive course can be maintained if SR continues to lease locomotives, considers a lease with an option to purchase and continues to contract out the maintenance of the locomotives. This strategy can be financed by internal cash flow. The least cost analysis summarized in Table 1 supports this conclusion.



## **II. Background: The Railway System**

Swaziland Railways is a small, 1067mm gauge railway with 301 km of single line track. It has two principal routes. One, the Goba line, runs west to east and was originally built to connect the iron ore deposits at Ngwenya with the port of Maputo in Mozambique. The depletion of the mine in 1980 coupled with growing strife in Mozambique meant that the route has been little used in recent years. With the Mozambique conflict over and the Maputo port open once again, shippers are expected to have renewed interest in the east-west line, the shortest passage to the sea. Seventy one kilometres of track at the western end that served the iron ore traffic are being uplifted and the materials used to help rehabilitate other parts of the route. Due to its deterioration, transit on the east-west line is restricted to 45km/hour.

The second route runs north to south from Kamatipoort in Transvaal South Africa to the border with Natal at Golela. In 1978 when the war in Mozambique cut off access to the port of Maputo, the southern part of the line was built to connect Swaziland with the port of Durban. The line was extended northwards to Kamatipoort in 1986 for the transit traffic between Zimbabwe and Transvaal and the ports of Richards Bay and Durban. The Transit line was built to a high technical specification using 48kg CWR and concrete sleepers to provide a 60km/hr line operating speed.

At present SR leases from Spoornet Class 37 and Class 34 locomotives for transit and cross-border traffic respectively. The Class 37 are leased on a need-dependent basis, roughly between 12 hours/day/locomotive. SR leases four Class 34 locos, but the lease terms permit this number to be increased to seven if required. The lease agreement for the Class 34 locomotives is to be renegotiated in 1998. SR presently carries about one (1) million net tons (NT) of cross-border freight and about three (3) million NT of transit freight. The availability of Class 37 locomotives is near 100% because they are leased on an hourly utilization basis and all maintenance is done by Spoornet. Class 34 locomotives are leased on a daily basis and Spoornet provides all the maintenance other than routine work and check-ups of less than six (6) months, which is done by SR. Spoornet has provided SR with a fifth Class 34 locomotive at no cost, which in effect gives SR a near 100% availability on the Class 34 locomotives as well.

Swaziland Railway is one of the highest tonnages per kilometer routes in sub-Saharan Africa outside South Africa. SR is also unique in Africa because it does not own locomotives, but relies on leasing from Spoornet. SR is also moving quickly to commercialize its operations. As a result of the restructuring carried out within the company from 1989 to April 1994, under the USAID Regional Rail



System Support (RRSS) project, SR's organization was streamlined to better suit the needs of a small, commercially-oriented operator. A Chief Executive Officer, who is a member of the Railway Board, has only four other chief officers reporting to him, viz: Director Finance, Director Traffic, Director Human Resources, and Director Engineering. The staff has been downsized from 1070 to 718 employees, and the railway now operates profitably.

### **III. Objectives**

The objective of this assignment is to identify, evaluate and recommend various options for leasing or acquiring through purchase locomotives for Swaziland Railway. There are three tasks associated with this assignment. The first is to provide guidance to SR's Board of Directors and management on the financial merits of purchasing locomotives or continuing to lease them. The second is to provide SR's management with recommendations for improving maintenance practices and standards, workshop and equipment facilities and workshop maintenance procedures. The final task involves the preparation of a financial profile on SR's preferred option for purchasing or leasing locomotives which could be presented to various institutions interested in participating in SR's future business. The timing of SR's decision on leasing or purchasing locomotives is partly driven by the September 1998 date for renegotiating the lease agreement with Spoornet on Class 34 locomotives, but also by a decision on whether to electrify the line from Phalaborwa for the transshipment of rock phosphate to Richards Bay.

### **IV. Methodology: Least Cost Solution**

The report compares the leasing and purchase alternatives on a discounted cash flow basis, using demand projections prepared by Coopers & Lybrand ("Swaziland Railways: Profit Forecast Scenarios 1996-2001", March, 1995) SR's present leasing arrangement, the base case, was subjected to least cost analysis in which it was compared to five alternatives:

1. purchase new locomotives with SR responsible for the maintenance
2. purchase new locomotives with the maintenance contracted out
3. purchase used locomotives with SR responsible for maintenance
4. purchase used locomotives with the maintenance contracted out, and
5. purchase used locomotives with the maintenance contracted out versus the base case with Spoornet raising its leasing charges by 20% in real terms in 1997/98.

Initially it was determined that the terms of the financing alone would not be sufficient to make purchase a lower cost alternative than a leasing arrangement and terms of ten years at 1% were considered the



norm thereafter. If purchasing became a lower cost option, a sensitivity analysis was undertaken at a higher rate of interest. Sensitivity analyses were also done changing the discount rate and the availability of locomotives. If a purchase option appeared as the lower cost, an internal rate of return (IRR) of the savings from the purchase option over the lease arrangement was calculated as was the number of years to break-even; that is, the number of years required for the discounted value of the annual savings from purchasing locomotives to equal the initial capital outlays in locomotives and maintenance facilities. The IRR would always be greater than the discount rate assumed in the analysis.

Cost estimates were made on an annual basis for ten years in constant dollar terms, and a terminal value given to the purchase of new locomotives. (A terminal value of zero is assumed if used locomotives are purchased.) The added investments and stream of annual costs associated with the various purchasing and maintenance options are compared with the base case at a discount rate which roughly approximates a required rate of return to SR (or to an investor in SR). Since SR only undertakes limited maintenance tasks, the maintenance costs were estimated from experience elsewhere and the annual costs over a six year cycle (which includes a major overhaul) were averaged and used. The maintenance costs for Class 34 locomotives were less than for Class 37 because SR already supplies the labor for most of the maintenance short of an overhaul. New locomotives were assumed to cost \$2 million each and have a terminal value of \$1 million after 10 years; used locomotives would cost \$1 million and have no value after 10 years. To upgrade SR's maintenance facilities to undertake all maintenance tasks was estimated by our senior railroad engineering consultant to cost \$1.8 million. No cost was added for consultants or training of SR staff or the addition of personnel. An exchange rate of E3.7 per US dollar was used to convert local expenditures to \$US. All the assumptions underpinning the analysis and the base case (i.e., the current situation) are listed in Annex 2.

The discount rates used in this analysis were 12%, 14% and 16%. Although there is no long term risk free bond market in Swaziland, Swaziland Government fixed interest rate notes with a redemption date of 05-07-1998 have a fixed interest rate of 12%. There was no quote on the Swaziland Stock Market to estimate its current yield. The rediscount rate of the Central Bank, as of 2/1995, was 12%. (The prime lending rate is between 15-16.5%). The closest proxy to a long term risk free rate is the government note mentioned above, or 12%. Swaziland is probably not a particularly high risk country; its currency is tied to the South African Rand on a 1:1 relationship. The key country risk is a devaluation of the currency should SR purchase locomotives with repayment required in a hard currency, such as the \$US, Yen or DM. This risk should be taken into account as a separate cost item in the cash flow of purchase options. This is not insignificant given that the Lilangeni has depreciated against the \$US at the rate 5.7%/year since 1989. We would only explicitly incorporate this in the



analysis if purchase options in general were lower cost compared to leasing.

The industry risk is more uncertain. SR is one of the few profitable government-owned enterprises in Swaziland. If one is going to invest in a government owned enterprise, this would be a comparatively low risk compared to other investments. There are three debentures listed on the Swaziland Stock Market. One is the Swaziland Sugar Assets (private), E12.5 million, redeemable by August 11, 2003 with a guarantee by Barclays Bank, issued in July 1993, which carries a fixed interest rate of 13.5%. Another is the Swaziland Posts & Telecommunications Corporation (government), E16 million, redeemable by November 30, 1999 with a guarantee by the Government of Swaziland, which carries a fixed interest rate of 13.25%. (Neither was traded on the exchange during the appraisal so a current yield could not be estimated.) The other is Swaziland Breweries. However, there is much uncertainty about the diversion of traffic from Zimbabwe and northern and northwestern South Africa away from Richards Bay and Durban to ports in Mozambique. A diversion of traffic could seriously depress, in fact could eliminate, SR's profitability. This risk must be accounted for by raising the discount rate by at least 2 percentage points (2%) above an assumed risk free rate of 12%. With prospects that interest rates may be rising in Swaziland, we have conducted the appraisal in a discount rate range of 12-16%.

Another consideration is availability. SR's present arrangement with Spoornet provides SR with virtually 100% availability of locomotives. If SR were to purchase locomotives, estimates must be made of the number of locomotives required to achieve the level of availability corresponding the projected freight demand, both transit and export-import. For 80% availability, SR would need eight Class 37 and five Class 34; for 60% availability, ten Class 37 and seven Class 34. SR's maintenance capability is an important factor in estimating availability. Given the relatively low level of availability achieved by countries such as Kenya, Nigeria and Zambia which have purchased locomotives and which have made the required investment in maintenance facilities for even major overhauls, comparisons were made using various assumptions about availability of locomotives in comparing purchasing options with the base case. SR will have to make a substantial investment in equipment and building to undertake maintenance of its own locomotives.

As a final feasibility check in high investment scenarios, the amount of increase in freight for total revenue to equal total cost was estimated - the break-even volume - to see whether such increases were attainable by SR. The revenue/NT was considered constant as were the average distances traveled by SR by commodity group.



## V. Analysis: Lease Versus Purchase

There is no interest rate the Government could charge SR for purchasing new locomotives that would favor this option over continuing the current leasing arrangement with Spoornet. Annex 2, Sheet 1 presents the base case - current leasing and compares it with purchasing new locomotives with in-house maintenance assuming 80% availability. An analysis of the sensitivity of the conclusion of this analysis to variations in the interest rate charged to SR for financing 50% of the initial investment costs was also made (see Table 2 below, 14% discount column). Attached to Annex 2, Sheet 1 are all the assumptions used in the appraisal.

<b>Table 2</b> <b>Purchase of New Locomotives</b> <b>NPV (in US\$000)</b>			
	Discount Rates		
	12%	14%	16%
Base Case: Current Situation	23865	22308	20933
Purchase Option (a): financing @ 10% interest*		33654	
Purchase Option (b): financing @ 5% interest*		31058	
Purchase Option (c): financing @ 1% interest*		28980	

**\*Assumptions:**

- Purchase Option (a): Assumes financing 50% of the capital costs of purchasing new locomotives and upgrading the maintenance facilities at terms of 10 years and **10%** interest on declining balance. No foreign exchange risk is assumed by SR.
- Purchase Option (b): Assumes financing 50% of the capital costs of purchasing new locomotives and upgrading the maintenance facilities at terms of 10 years and **5%** interest on the declining balance. No foreign exchange risk is assumed by SR.
- Purchase Option (c): Assumes financing 50% of the capital costs of purchasing new locomotives and upgrading the maintenance facilities at terms of 10 years and **1%** interest on the declining balance. No foreign exchange risk is assumed by SR.



Purchasing new locomotives is more costly than the current leasing arrangement by \$6.6-11.4 million, depending on the interest rate charged to SR for financing 50% of the cost of the locomotives. As a point of reference, the IRR of the 1% interest rate scenario is 3.20% with a break-even point well in excess of 10 years. (See Annex 2.)

The analysis presented in Table 2 assumes an availability rate of 80%. An 80% availability requires SR to purchase 8 class 37 and 5 class 34 locomotives. A more realistic assumption would be to assume a 60% availability rate which would require the purchase of 17 locomotives: 10 Class 37 and 7 Class 34. The net present value (NPV) of purchasing new locomotives assuming 60% availability and in-house maintenance is \$36400 at a 14% discount rate. The assumption of a 60% availability rate increases the cost to SR on a NPV basis by \$7.4 million over the 80% availability scenario. (See Annex 2, Sheet 1a.)

If SR contracted out the maintenance function with a guarantee of 80% availability (as is realized under the current arrangement with Spoornet), leasing would still be the least cost option (Table 3 and Annex 2, Sheet 3).



<b>Table 3</b> <b>Alternative Maintenance Scenarios*</b> <b>NPV (in US\$000)</b>			
	Discount Rates		
	12%	14%	16%
Base Case: Current Situation	23865	22308	20933
Purchase with Contracted Maintenance Option (a): 80% availability*	33789	32032	30482
Purchase with Contracted Maintenance Option (b): 60% availability*		36400	

\*Calculations assume financing of 50% of the total purchase price at a 1% interest rate.

Again, the current leasing arrangement would continue a lower cost option than either of the maintenance scenarios presented above. However, the current leasing arrangement is more expensive than SR doing in-house maintenance if SR can achieve 80% availability, i.e., \$28,980 (see Table 2), but less expensive if SR can only achieve 60% availability through in-house maintenance, i.e., \$36,400 (see Table 3).

The purchase of used locomotives becomes a viable option if SR can achieve an availability rate of 80% with in-house maintenance. If only 60% availability is achieved, continuing the present leasing arrangement is a lower cost option. If SR cannot achieve close to 80% availability through in-house maintenance, it is better to contract out the maintenance with a guarantee of 80% availability. But this option is also higher cost than the current leasing arrangement, i.e., \$25,426 versus \$22,307. (See Table 4 and Annex 2, Sheet 4 , Sheet 5 and Sheet 6.)



<b>Table 4</b> <b>Purchase of Used Locomotives</b> <b>NPV (in US\$000)</b>			
	Discount Rates		
	12%	14%	16%
<b>Base Case: Current Situation</b>	<b>23865</b>	<b>22308</b>	<b>20933</b>
Purchase Option (a): financing @ 10% interest*	23508	22377	21378
Purchase Option (b): financing @ 5% interest*	29142	27764	26548
Purchase Option (c): financing @ 1% interest*	26887	25426	24137

\*Assumptions:

- Purchase Option (a): Assumes the purchase of used equipment and **in-house performance of the maintenance function at an 80% availability rate**. Financing terms are assumed to be 10 years at 1% interest.
- Purchase Option (b): Assumes the purchase of used equipment and **in-house performance of the maintenance function at a 60% availability rate**. Financing terms are assumed to be 10 years at 1% interest.
- Purchase Option (c): Assumes the purchase of used equipment and **contracted maintenance with a guarantee of 80% availability**. Financing terms are assumed to be 10 years at 1% interest.

However, if Spoornet were to raise its leasing fees by 20% in real terms in 1997/98, the option of purchasing used equipment and contracting out the maintenance function would be about equivalent on a discounted cost basis at 14% to the leasing arrangement with Spoornet, i.e., \$25426 versus \$25425 (see Table 5 and Annex 2, Sheet 7 ). The IRR would be 14%, the same as the discount rate and the break-even point would be 10 years.



<b>Table 5</b> <b>Cost of Current Lease Increases</b> <b>NPV (in US\$000)</b>				
	Discount Rates			
	12%	14%	16%	18%
<b>Base Case: Current Situation</b>	<b>23865</b>	<b>22308</b>	<b>20933</b>	<b>19716</b>
Modified Current Situation: Increasing Lease Payments*	27283	25425	23787	22337
Purchase Option (c): financing @ 1% interest*	26887	25426	24137	22995

\* Assumptions:

Modified Current Situation: Assumes escalation of leasing fees in real terms by 20%.

Purchase Option (c): Assumes the purchase of used equipment and **contracted maintenance with a guarantee of 80% availability**. Financing terms are assumed to be 10 years at 1% interest.

At a 12% discount rate, the purchase of used equipment with 1% financing and contracting out the maintenance function with an 80% guarantee of availability becomes a lower cost option if Spoornet raises its leasing fees by 20% or more in real terms by 1997/98, i.e., \$26887 versus \$27283 (see Table 5). This is a typical crossover phenomenon when choosing between a high up-front investment, lower operating cost option, and a low up-front investment, higher operating cost option. Under the scenario of a 20% or greater real escalation in leasing fees, and without consideration of the foreign exchange risk of purchasing, SR would view the two options as equivalent from a financial standpoint at the 14% discount rate. At a 12% discount rate, purchasing would be the preferred financial option, and at 16%, leasing would be the lower cost option (see Chart 1 attached).

If SR were to purchase new locomotives, the amount of traffic carried would have to increase by over 1,000,000 NT per year (assuming 60% availability) to break - even. (See Annex 2, Sheet 8.)

Although the assignment did not require consideration of options other than lease or purchase of equipment by SR, other alternatives to a straight leasing agreement should also be considered. One



alternative would be to enter into a lease arrangement with Spoornet (or TransNamib) to lease locomotives with an option to purchase. This option may be worth considering if there is pressure within the Swaziland government to purchase rather than lease locomotives. A lease with an option to purchase would allow sufficient time for SR to evaluate the extent to which their freight traffic is diverted due to the reopening of the Mozambican ports. SR may also analyze substituting shunter and trip locomotives for mainline locomotives and review the lease - purchase option for export-import traffic (see Annex 1, Railroad Engineer's Report, paragraph 4.6).

Although this may be politically unpalatable, another viable alternative would be to lease the transit right-of-way to Spoornet. Such an arrangement would allow Spoornet to operate through Swaziland, thus avoiding delays associated with locomotive and crew changes at the borders. SR could capture this saving in a right-of-way fee that exceeds its margins under the current lease arrangement. Spoornet may be indifferent to paying SR a right-of-way fee provided the fee is positive when calculated as the sum of the loss of Spoornet's profit from leasing locomotives to SR, the new costs incurred for locomotives and crews needed to traverse Swaziland, the costs avoided by eliminating non-revenue time and crew associated with locomotive changes at the border and the avoided cost of the freight fee currently charged by SR. Even if this calculation is negative, SR could presumably raise its freight rate. SR's right-of-way costs would have to be deducted from a right-of-way fee, or added as the case may be, to determine a profitable right-of-way charge. This profitability could then be compared to SR's profitability under the current leasing arrangement to see which is better for SR. All calculations would be done on a NTKM basis.

A similar approach could be used in preparing a SR negotiating position vis a vis Spoornet, TransNamib or other lessor, on a new leasing agreement. However, should a leasing or purchasing agreement be contemplated between SR and a country other than South Africa, SR should first negotiate a long term traffic agreement with Spoornet.

## **VI. Maintenance**

Both the Class 37 and Class 34 locos have maintenance cycles based on daily, monthly, three monthly, semi-annual, and annual maintenance examination schedules. All maintenance for the Class 37 locos is carried out by Spoornet in South Africa under the terms of the lease agreement. Major examinations (i.e., semi-annual and annual) for the Class 34 locos are also performed by Spoornet under the same terms as for the Class 37 locos, while minor exams are carried out by SR staff at its modern maintenance depot at Mpaka. These minor exams are little more than servicing schedules. Details of the



examinations due and the spare parts to complete them are supplied by Spoornet monthly. Only a minimum store of parts inventory is held at the Mpaka Depot, and there is no need for any specialized facilities or equipment.

The Mechanical Engineer reporting to the Director of Engineering is responsible for traction and traction maintenance. For this activity he has a staff of 11, all based at the Mpaka Depot; 1 manager, 1 Foreman, 0 Supervisors and 9 other staff (2 technicians, 2 artisans, 3 asst. artisans and 2 handymen). Three are ex-steam fitters. Only the manager is skilled, though all staff have received some training from Spoornet. If SR were to consider carrying out all depot maintenance in-house, the depot staff, at minimum, would have to be tripled and a fully qualified small engineering team established. It is very doubtful whether these skills are available in Swaziland and it would take a minimum of five years to train the staff. In addition many new maintenance systems and procedures, currently maintained by Spoornet would have to be set up in SR, eg maintenance records, component records, maintenance planning and control, detailed fault recording and analyses, etc.

While the structure of the depot at Mpaka is adequate it would require equipping to provide a full maintenance capability, viz: a wheel lathe for tire turning, small machine tools (pedestal drills, lathes, etc), hydraulic jacks for bogie lifting and TM replacements, 2x10T overhead cranes for power unit removals, laboratory and testing equipment (spectrographic oil analysis, fuel injectors and pump testing and calibration, governor testing, etc), and hand tools. The present spares inventory stores is not large enough to house a full inventory and a new one will require constructing. The total estimated cost to equip the depot is US\$ 1.75m.

Locomotive availability is the single most important factor affecting the efficient operation and profitability of railways across Africa. Railway engineering departments struggle to achieve 60% availability and more often than not it is around 50%, despite massive injections of capital and technical assistance by aid agencies. Donors have made the contracting out of maintenance to a third party a condition of further assistance to railway companies. The advantage of this approach is that the contract can be performance related and a guaranteed level of availability negotiated. Regardless of whether SR decides to own its own locomotives or to undertake all maintenance in-country, it is strongly recommended that maintenance be contracted-out, as it would require a large investment of time and financial resources for SR to achieve the availability levels realized under the current arrangement with Spoornet.

SR faces two basic options: to lease or to purchase locomotives. The importance of maintenance and



its effect on availability has already been stressed. Therefore each of the two basic options should be considered with in-house or contract maintenance. The locos could be either new or secondhand. Combinations of these basic options are also feasible, e.g., the purchase of some locos, while the remainder are leased. The financial analysis will point towards the most cost effective solution but in reaching a conclusion other factors will need to be taken into consideration that are discussed below.

The current arrangement with Spoornet has many advantages, particularly the Class 37 hiring agreement which in effect gives a guaranteed 100% availability. No ownership scenario will offer this, whether maintenance is carried out in-house or contracted out it would be difficult to achieve greater than 80% availability. The availability with the Class 34 leasing agreement is in effect 80% because Spoornet provides a fifth loco for maintenance cover. The problem with this agreement is the low utilization of the locos. This could be partially overcome by leasing two trip locos in lieu of two mainline. The current maintenance arrangements appear to work satisfactorily, although it would be more advantageous to have the same maintenance arrangement for the Class 34 locos as for the Class 37 locos. The extension of the Class 37 maintenance arrangement to include the Class 34 locos would eliminate the need for SR to carry out any in-house maintenance and thereby allow management to concentrate on the core activity of train operations.

The perceived advantage of purchasing and owning locomotives is to be in control and not dependent upon another organization for something as fundamental as the provision of motive power. The disadvantages are the financial burden and the demands to manage the fleet, to provide maintenance, and obtain the required levels of availability. The financial burden could be reduced by purchasing second hand locos, but these would probably need a general overhaul or refurbishment before entering service. Whether new or second hand locos are obtained, only simple, basic equipment should be specified. SR should resist the temptation to acquire high tech, state-of-the-art, electronically controlled locos. The choice between developing a full in-house maintenance capability and contracting-out this service, whether in-country or externally, is an important one for SR. The issues and costs have been covered in previous sections of this report. Based upon this analysis, SR is strongly advised to continue to contract out the maintenance function, even if it is decided to purchase locos.



## **VII. Conclusions and Recommendations**

The analysis described in Section V. of this report suggests that SR should continue to lease locomotives. This is by far the least cost approach to carrying the projected level of freight over the next few years. This conclusion is unaffected by the financing terms for purchasing locomotives and a discount rate in the range of SR's required return on capital (often referred to as the opportunity cost of money) under various scenarios used to calculate the net present value (or net present worth). Moreover, there are uncertainties regarding the future demand for SR services created by the reopening of Mozambican ports. The risk associated with the purchase option is further increased because of the apparent oversupply of locomotives in the region: if demand decreases, SR may not be able to find buyers for their equipment.

Ownership carries a certain amount of prestige and national pride. SR could enhance the national identity of the company by painting the leased locomotives with the SR logo and colors. SR might also negotiate a lease agreement with a purchase option with Spoornet or another lessor in the region. However, if SR decides to purchase locomotives or lease them from a country other than South Africa, it is recommended that SR negotiate a long term traffic agreement with Spoornet. SR should also examine whether it would be cost effective to use trip or shunter locomotives in lieu of a mainline locomotive at certain locations on its east-west line.

Several maintenance options available to SR were examined, including the development of an in-house capability, contracting out the maintenance function, and contracting out with a guarantee of availability. Our examination of each option in terms of SR's capability and the implications for the lease-purchase options indicates that the single most important factor in raising the cost of purchasing locomotives compared to leasing is the availability (as a function of maintenance efficiency) of locomotives. The railway engineer on the mission estimated that it would take SR at least five years and an initial investment of \$1.8 million to achieve an 80% availability rate. Therefore, SR should continue to contract out its maintenance regardless of whether it buys or leases locomotives. SR should also carefully manage any leasing or maintenance contract and carefully monitor reliability, claiming compensation if it falls below the agreed standard.

Although many suppliers contacted indicated that they could provide locomotives on a lease or purchase basis, the only way to test this is to ask for bids against detailed specifications of SR's requirements. Annex 5 provides a draft prospectus for bids to test the assumptions made in this analysis on the price of used locomotives, terminal values, cost of maintenance and terms of financing.



SR might also consider the option of leasing Spoornet the right-of-way for transit through Swaziland. Even if SR does not wish to pursue this option, the exercise of estimating an appropriate right-of-way fee would be a useful framework for SR to develop key negotiating positions for a new lease with Spoornet or other lessor in the region.



**ANNEX 1**  
**Railway Engineer's Report**



## **I. Introduction**

Swaziland Railways is a small 1067mm gauge railway with 301km of single line track. It has two principle routes, one running west to east originally built to connect the iron ore deposits at Ngwenya with the port of Maputo in Mozambique. The ore deposits were exhausted in 1980 and because of this and the war in Mozambique the route has been little used in recent years. This line, the Goba line, provides the shortest route to the sea for Swaziland's import/export traffic and now that the war in Mozambique is over more shippers may use this route again once confidence in Maputo port has been restored. Seventy one kilometres of track at the western end that served the iron ore traffic are being uplifted and the materials used to help rehabilitate other parts of the route. Due to its deterioration the East/West line has a 45km/hr speed restriction applied. The second route runs north to south from in Transvaal South Africa to the border with Natal at Golela. The southern part of the line was built originally in 1978, to give Swaziland access to Durban when the war in Mozambique cut off access to the port of Maputo. The line was extended northwards to Komatipoort in 1986 for the transit traffic between Zimbabwe and Transvaal and the ports of Richards Bay and Durban. The Transit line was built to a high technical specification using 48kg CWR and concrete sleepers to provide a 60km/hr line operating speed.

The railway carries 4 million tonnes of traffic per year, one of the highest tonnages per kilometre of route in sub-Saharan Africa outside South Africa. The railway is now operated profitably as a result of the restructuring carried out as part of the USAID Regional Rail System Support (RRSS) project launched in 1987 to provide assistance to Swaziland Railways, Malawi Railways and CFM in Mozambique and completed in April 1994. In 1993/94 it made a surplus of E10.212m before interest and depreciation on revenues of E72.026m.

The SR management organization was restructured as part of the RRSS project. The organization now better suits the size and scope of the railway. A Chief Executive Officer, who is a member of the Railway Board, has four other chief officers reporting to him, viz: Director Finance, Director Traffic, Director Human Resources, and Director Engineering. In 1994 there were 718 employees, which is high by Western standards, but not extraordinary for Africa.

Swaziland railways is also unique in Africa because it does not own any locomotives. It currently relies on the hiring/leasing of locomotives from Spoornet, South African railways. The purpose of this study is to assess whether the current arrangements are the most cost effective and appropriate, and to identify, evaluate and recommend alternative options for leasing or acquiring through purchasing locomotives.



## **II. Current Motive Power Fleet Arrangements.**

SR's current motive power fleet consists of ten locomotives. Six of these are Class 37 General Motors (GM) type GT26M2C 2911 hp Co-Co diesel electric main line locomotives used for hauling the transit traffic. They are hired on an hourly basis from Spoornet. The other four are Class 34 GM type GT26MC 2600hp Co-Co diesel electric main line locomotives used for the import-export traffic. These locomotives are hired on a permanent basis from Spoornet under a five year leasing agreement.

### **A. Class 37 Locomotives**

The model GT26M2C locomotive is equipped with a turbo-charged diesel engine delivering 2911hp to the main generator for traction purposes. The locomotive has six axles each of which is geared to a traction motor. The axle load is 19T. On the transit trains the locomotives operate in multiples of three hauling 6400T trains. Transit traffic accounts for 78% of SR total traffic and 569.242mNTK. The average length of haul is 186kms. The Class 37 locos are hired on an hourly basis from Spoornet. In 1994/95 26000 engine hours were hired at a total cost, including fuel, of E10,322,000. This represents an average utilization of 12 hrs\loco\day. All the maintenance is undertaken by Spoornet and the cost is included in the hire charge.

### **B. Class 34 Locomotives**

The model GT26MC locomotive is similar to the Class 37 but developing a lower 2600hp and is marginally lighter in weight. The locos are used to haul 1500T trains on the west/east line. However, it should be noted that of the 4702 engine hours recorded in 1993/94, 80% were on shunting duties. Four of these locomotives are on permanent hire from Spoornet under a five-year leasing agreement signed in 1992. (In practice Spoornet provide 5 locomotives, the fifth loco in effect providing maintenance cover.) The leasing agreement allows the number of locos to be increased from four up to seven if required by giving seven days notice in writing. SR takes advantage of this option during the high season for the citrus fruits and sugar traffic. The charge is 1900R/loco/day, but if the agreement is terminated by SR before 1997 the charge is raised to 2100R/loco/day. The hire charge may be increased each year in line with increases in the South African PPI (Production Price Index) but may not exceed 15% in any one year.

### **C. Lease Terms**



## ***Financial Appraisal of Locomotive Lease-Purchase Options for Swaziland Railways***

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The agreement requires the lessee, SR, at its own expense to:

- C Provide competent locomotive crews.
- C Supply all fuel or compensate Spoornet.
- C Perform daily maintenance inspections and monthly exams.
- C Carry out minor repairs.
- C Furnish monthly statistics on fuel and oil consumption, utilization, oil analyses and components exchanged.
- C Return each loco back to Spoornet every 180 days for maintenance.

The lessor, Spoornet, is responsible for:

- C Carrying out semi-annual and annual exams.
- C Provide the lessee with all lubricants, brake blocks, electrical bushes and lights that may be required for the maintenance.
- C Stock of emergency repairs.
- C Provide a replacement loco within 48 hrs subject to availability.

The market value of each locomotive (as recorded for insurance/compensation purposes should a locomotive be badly damaged or written off) is 2,100,000R.

SR renegotiated part of the Class 37 agreement this year to enable them to take advantage of the lower fuel prices in Swaziland. This has reduced the hourly charge from E426 to E397 per hour. The advantage of the Class 37 agreement is that SR only pay for locomotives used for revenue earning, there is no down time or unproductive time to pay for and they do not have to concern themselves with any maintenance. The Class 34 agreement requires SR to undertake some maintenance which costs approximately E100,000 per loco per annum, or about E278 per day. When added to the daily hire charge a Class 34 must be utilized at least 10 hours per day before its agreement becomes more cost effective than the Class 37 agreement and that is without taking account of the advantage of only paying for productive hours, having in effect 100% availability of motive power and not having to manage a maintenance activity. At present the Class 34 utilization is 7.6hrs/loco/day.

It is important that both of these agreements are carefully monitored and managed by SR. While some attempt is made to monitor certain features of the Class 34, agreement very few records appear to exist on the Class 37 locomotive performance. Also, the Class 34 monitoring is made less meaningful because Spoornet does not always return the same locomotive back to traffic in Swaziland after maintenance. This issue was taken up by SR recently and a dedicated fleet has now been identified by



Spoornet. It is strongly recommended that SR keep up to date records for each class of locomotive on utilization (measured in terms of kilometres and engine or locomotive hours), failures in traffic and reliability (measured in terms of mean time between failures and calculated on a moving average basis).

### **III. Locomotive Maintenance**

The modern, pre-fabricated steel construction maintenance depot, built in 1985 to a very high standard is located at Mpaka. It is "L" shaped and high roofed with two roads and pits down the long side measuring 50m x 30m for loco maintenance with continuous solebar level working platforms running down the middle and each side. A 5T overhead crane serves both these roads with sufficient clearance to lift components through the roof of the loco. The remaining area measuring 35m x 30m has two roads with the rails set in the floor for standage. Down the 50m and 35m sides of the depot are offices, store rooms and laboratory/test rooms. The latter have never been equipped except for some basic battery charging equipment.

By any standards this is an excellent maintenance/servicing depot structure and even though it is ten years old it is to SR's credit that it is still in a clean and pristine condition though this may be partially explained by the fact that the work carried out at the depot is minimal and does not involve a lot of heavy dirty work. The size and structure of the facility is significantly bigger than is required for the limited maintenance that is performed by SR. It is used to service the five Class 34 locos and it also acts as the depot and signing on point for the train crews.

Both the Class 37 and Class 34 locos have maintenance cycles based on daily, monthly, 3 monthly, 6 monthly and yearly maintenance examination schedules. All the maintenance for the Class 37 locos is carried out by Spoornet in South Africa as part of the hiring agreement. Major examinations (i.e., semi-annual and annual) for the Class 34 locos are also performed by Spoornet under the same terms as for the Class 37 locos, while the minor exams are carried out by SR staff at Mpaka Depot. These minor exams are little more than servicing schedules. Details of the examinations due and the spare parts to complete them are supplied by Spoornet monthly. There is a need for only a minimum store of parts inventory to be held at the depot and there is no need for any specialized facilities or equipment.

The Mechanical Engineer reporting to the Director of Engineering is responsible for traction and traction maintenance. For this activity he has a staff of 11, all based at the Mpaka Depot; 1 manager, 1 Foreman, 0 Supervisors and 9 other staff (2 technicians, 2 artisans, 3 asst. artisans and 2 handymen). Three are ex-steam fitters. Only the manager is skilled, though all staff have received some training from



Spoornet. If SR were to consider carrying out all depot maintenance in-house, the depot staff, at minimum, would have to be tripled and a fully qualified small engineering team established. It is very doubtful whether these skills are available in Swaziland and it would take a minimum of five years to train the staff. In addition many new maintenance systems and procedures, currently maintained by Spoornet would have to be set up in SR, eg maintenance records, component records, maintenance planning and control, detailed fault recording and analyses, etc.

While the structure of the depot at Mpaka is adequate it would require equipping to provide a full maintenance capability, viz: a wheel lathe for tire turning, small machine tools (pedestal drills, lathes, etc), hydraulic jacks for bogie lifting and TM replacements, 2x10T overhead cranes for power unit removals, laboratory and testing equipment (spectrographic oil analysis, fuel injectors and pump testing and calibration, governor testing, etc), and hand tools. The present spares inventory stores is not large enough to house a full inventory and a new one will require constructing. The total estimated cost to equip the depot is US\$ 1.75m.

Locomotive availability is the single most important factor affecting the efficient operation and profitability of railways across Africa. Railway engineering departments struggle to achieve 60% availability and more often than not it is around 50%, despite massive injections of capital and technical assistance by aid agencies. Donors have made the contracting out of maintenance to a third party a condition of further assistance to railway companies. The advantage of this approach is that the contract can be performance related and a guaranteed level of availability negotiated. Regardless of whether SR decides to own its own locomotives or to undertake all maintenance in-country, it is strongly recommended that maintenance be contracted-out, as it would require a large investment of time and financial resources for SR to achieve the availability levels realized under the current arrangement with Spoornet.

#### **IV. Traffic and Operating Characteristics**

As previously stated, SR has two principal routes, one running north to south for transit traffic between Zaire, Zambia, Zimbabwe and Eastern Transvaal to Durban/Richards Bay; the other running east/west from Maputo to Matsapha II via Mpaka and Phuzumoya for import/export traffic. The principal transit traffics are rock phosphate (1.8mT), phosphoric acid (0.3mT) and other mineral ores (0.2mT) from Phalaborwa in Transvaal to Richards Bay. In the reverse direction the traffic is mainly containers. Class 37 locos are used for this traffic and there are four up (to Richards Bay) and four down trains (from Richards Bay) scheduled per day. The rock phosphate traffic is moved in block trains (eighty 80T air



braked open wagons), the 6400T gross weight train hauled by three Class 37 locos. The transit time is 6 hrs 43 mins in the up loaded direction and 5 hrs 52 mins for the return empty journey. Train crews are changed at Mpaka and work through to both Komatipoort and Golela in South Africa. Vacuum braked trains are restricted to 40 vehicles. The line speed is 60kph and the maximum axle load 20T. There are no severe gradients on the line. The distance from Komatipoort to Golela, is 251kms, 186 in Swaziland. This route to Durban/Richards bay is 270kms shorter than the alternative route through South Africa.

The principle East/West traffics are cement and wood pulp from Matsapha to Maputo, citrus fruits from Big Bend / Mhlume to Maputo and, as of the beginning of this year, 190000T of sugar from Mlawula and Phuzumoya to Maputo. There are no imports through Maputo. There is a daily train between Matsapha and Siweni (the border with Mozambique). The Class 34 locos are used on this route hauling 1850T (30 wagon) trains but have to be restricted or double headed in certain sections due to heavy grades particularly between Sidvokodvo and Matsapha (2%, 1 in 50 grade).

Main line locos are used for shunting, both for picking up and setting down wagons at nominated stations on certain designated services, and for shunting "turns" at Matsapha II (daily 24 hours), Mlawula ( daily 24 hours including trip working between Mpaka and Swini) and at Phuzumoya (daily for four hours but only on request, loco sent from Mpaka). SR is aware that this is poor utilization of main line locos. Consideration should be given to acquiring two smaller locos for the turns at Matsapha and Mlawuli. Because of the trip working shunting locos will be unsuitable but it should be feasible and cheaper to use 1000hp Bo-Bo diesel electric trip locos. Using simple shunter locos would create maintenance problems but trip locos could return easily to Mpaka as part of their normal duties for maintenance.

In recent years accidents have become a serious management problem. On a railway the size of SR the cost of one serious accident could wipe out the years total operating profit. Over the past two years SR have addressed the problem, introduced new reporting procedures, awareness and education programmes for the staff coupled with an incentive scheme and established a Safety Unit reporting to the Director Operations. All major accidents i.e., those that affect the main line, involve personal injury, or cause damage greater than E100,000 are subject of an official enquiry. Safety committees have been established involving the various groups of staff, e.g., drivers, and if a group of staff are accident free for 3 months they are given recognition and a bonus in the form of a brai. The introduction of the radio train control system has also helped to improve safety. In the past twelve months the number of accidents reported has been reduced by 50%. Throughout many African railways accidents are becoming a



serious problem as discipline breaks down through poor supervision and the spread of alcoholism and drugs. The positive action taken by the management of SR is to be commended. The possible benefits of computerizing the accident records should be investigated, particularly to detect and priorities technical causes and trends.

## **V. Motive Power Options**

SR faces two basic options: to lease or to purchase locomotives. The importance of maintenance and its effect on availability has already been stressed. Therefore each of the two basic options should be considered with in-house or contract maintenance. The locos could be either new or secondhand. Combinations of these basic options are also feasible, e.g., the purchase of some locos, while the remainder are leased. The financial analysis will point towards the most cost effective solution but in reaching a conclusion other factors will need to be taken into consideration that are discussed below.

The current arrangement with Spoornet has many advantages, particularly the Class 37 hiring agreement which in effect gives a guaranteed 100% availability. No ownership scenario will offer this, whether maintenance is carried out in-house or contracted out it would be difficult to achieve greater than 80% availability. The availability with the Class 34 leasing agreement is in effect 80% because Spoornet provides a fifth loco for maintenance cover. The problem with this agreement is the low utilization of the locos. This could be partially overcome by leasing two trip locos in lieu of two mainline. The current maintenance arrangements appear to work satisfactorily, although it would be more advantageous to have the same maintenance arrangement for the Class 34 locos as for the Class 37 locos. The extension of the Class 37 maintenance arrangement to include the Class 34 locos would eliminate the need for SR to carry out any in-house maintenance and thereby allow management to concentrate on the core activity of train operations.

The perceived advantage of purchasing and owning locomotives is to be in control and not dependent upon another organization for something as fundamental as the provision of motive power. The disadvantages are the financial burden and the demands to manage the fleet, the provide maintenance, and obtain the required levels of availability. The financial burden could be reduced by purchasing second hand locos, but these would probably need a general overhaul or refurbishment before entering service. Whether new or second hand locos are obtained, only simple, basic equipment should be specified. SR should resist the temptation to acquire high tech, state-of-the-art, electronically controlled locos. The choice between developing a full in-house maintenance capability and contracting-out this service, whether in-country or externally, is an important one for SR. The issues and costs have been



covered in Section III. above. Based upon this analysis, SR is strongly advised to continue to contract out the maintenance function, even if it is decided to purchase locos.

Another option is to purchase the shunter/trip locos and continue to lease the mainline locos. There are no real advantages to this option and the problem would be the difficulty to arrange a suitable maintenance contract for the few owned locos. The main advantage of the present arrangement is its flexibility and the lack of any need to heavily invest in expensive long term assets. This is particularly appropriate for the transit traffic because an alternative route exists and there is no long term commitment or formal agreement by Spoornet to use Swaziland. In these circumstances a lease/buy option may be attractive whereby SR lease the fleet of locos with an option to buy at a future date if and when a long term traffic agreement was signed with Spoornet.

## **VI. Potential Suppliers of Locomotives.**

Many of the above options are feasible only if alternative sources of locos to Spoornet are available. A meeting was held in Johannesburg with Transtrade, the international marketing arm of Spoornet, and a number of potential alternative suppliers contacted.

### **A. Transtrade (Spoornet)**

Spoornet, through Transtrade, would be pleased to discuss and consider any alternative proposal put to them by SR. The main points which come out of the meeting with Mr von Gericke were:

- C There is no hidden agenda relative to Spoornet's relationship with SR.
- C Spoornet would seriously consider a lease and buy option.
- C Transtrade would be prepared to negotiate a refurbishment and maintenance contract with SR for any secondhand locos purchased from Spoornet.
- C With regard to the long term availability of locos from Spoornet, Transtrade is establishing a leasing company and if a suitable market exists would consider purchasing new or secondhand locos for leasing to new/existing customers.
- C In addition to the current Class 37 and 34 locos, Transtrade has the following classes of locos available for leasing/purchasing:
  - Class 35 : 1500hp Co-Co 13.7t axle load.
  - Class 33 : 2000hp Co-Co 15.7t axle load.
  - Class 36 : availability to be confirmed by Transtrade.
- C SR should discuss/negotiate any new agreements with Transtrade rather than direct with



Spoornet.

**B. GEC-Alsthom and ABB Transportation**

Both would be prepared to tender for supply of new locos, or refurbishment/overhaul of secondhand locos and/or a maintenance contract irrespective of the source of supply and whether the locos are owned or leased.

**C. TransNamib**

TransNamib have confirmed in writing that they have available 12 GE Type U20C locos for sale at a price of US\$ 340,000/loco. These are ex-Spoornet Class 33-400 locos 2000hp 16t axle load and are also available for leasing at 2000R per day. For either the purchase or leasing option. TransNamib would be prepared to negotiate a maintenance contract. The condition of sale is "as is" and the sale is subject to availability at date of final negotiations.

Mr. Kedia, Senior Engineering Adviser, World Bank and Task Manager for railway projects in Central/Southern Africa has confirmed that there are surplus locos available in Zambia (15 type GT36CU-MP delivered in 1990 from GM Canada), Zimbabwe (15 all requiring overhaul), and Malawi (12 MLW 1500hp locos, of which 7 require overhaul).

There is therefore no shortage of locos for hire or purchase nor of companies willing and prepared to do overhauls and to provide maintenance contracts.

**VII. Conclusions**

The key conclusions of the analysis are:

- C SR should negotiate a long term traffic agreement with Spoornet.
- C SR should not contemplate undertaking in-house maintenance. It would be full of risk and take SR at least 5 years, if ever, to develop a capability.
- C Unless the financial case is overwhelming SR should not consider purchasing locos and then only if a maintenance contract is obtained.



***Financial Appraisal of Locomotive Lease-Purchase Options for Swaziland Railways***

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- C      Leased locos should be painted in SR colours to provide a corporate identity.
- C      There appears to be no shortage of locos for sale or hire in Southern Africa.
- C      East/West traffic loco utilization should be improved and the benefits of using shunter or trip locos at certain locations evaluated.
- C      SR should carefully manage any leasing or maintenance contract and carefully monitor reliability, claiming compensation if it is below an agreed standard.
- C      The RRSS Project has been successful and SR is now a small, profitable and well managed railway.



**ANNEX 2**  
**Pro-Forma Financial Implications of Options**





**Notes to Lease-Purchase Financial Analysis  
Base Case/Current Situation**

1. Annual Operations: 1994/95 traffic in NT taken from Appendix 1, *Swaziland Railway Profit Forecast Scenarios, 1996-2001*, Coopers & Lybrand, March 1995.

The average distance of 159 km is assumed for Ex-Im traffic and 189 km for transit. (Note: SR currently assumes an average distance of 186.)

2. Lease Fees:

	Transit Traffic	Ex-Im Traffic
# of Locomotives	6	4
Fee	E397/hr	E2051/day
Hours/loco/year	4333	2748
Days/year	360	360
Exchange Rate	E3.7 = US\$1	E3.7 = US\$1

3. Discount Rate is 14%
4. Assumes the purchase of 10 locomotives at a unit cost of \$2 million for new Class 37 and Class 34 locomotives or \$1 million for used Class 37's and 34's or new shuntings.
5. Financing terms are assumed to be:
- C 10 year amortization period
  - C 10% interest rate on the declining balance
  - C 0% financing fee



6. Maintenance assumptions\*:

Year	Transit	Ex-Im
1	60,000	30,000
2	60,000	30,000
3	110,000	110,000
4	60,000	30,000
5	60,000	30,000
6	200,000	200,000
average	91,667	66,667

\*Note: Figures based on international experience and not derived from cost records at SR. In the case of Ex-Im locos, SR provides labor for regular maintenance for cycles less than six months.

7. Fuel:

SR pays fuel for transit. This cost is included in the hourly lease agreement. We assume that the implicit price of fuel in the lease agreement for Class 37 locos is E1.158/liter.

Assumptions for Ex-Im fuel cost estimates are as follows:

C	# of locomotives:	4
C	price/liter:	E1.21
C	liters/day:	175
C	hours/day:	7.633
C	days/year	360
C	exchange rate	E3.7 = US\$1

8. Equipment Life:

New locomotives:	25 years; 50% residual value after 10 years
Used locomotives:	10 years; 0% residual value thereafter



9. Availability:

Availability	Transit Locos	Ex-Im Locos
100%	6	4*
80%	8	5
60%	10	7

\*Spoornet currently provides access to one (1) additional locomotive at no cost. Analysis assumes 100% availability under the base case lease scenario, for Transit locomotives and 80% for ExIm locomotives.

10. In-house maintenance: Assumptions regarding the cost of increasing the capacity of current maintenance facilities to provide full maintenance services are based on the following estimates:

(\$millions)		
C	Wheel lathes	1.00
C	Work Shop Machine Tools	0.150
C	Other Equipment	0.350
C	Building & Waste Disposal	0.155
C	<u>Contingency</u>	<u>0.166</u>
C	<u>Total</u>	<u>1.821</u>



















**ANNEX 3**  
**List of Field Contacts**



**List of Field Contacts**

**Swaziland Railway**

- C G. Mahlalela, Chief Executive Officer
- C S. Ngubane, Director Traffic
- C T. Ndlovu, Director Engineering
- C M. Mabuza, Director Human Resources & Development
- C V. Makhubu, Asst. Director Finance
- C M. Nkwanyane, Mechanical Engineer

**USAID/Swaziland**

- C J. Royer, Acting Director
- C J. Raile, Senior Project Manager
- C J. L. Jackson, Consultant

**Coopers & Lybrand - Swaziland**

- C A. Clarke

**Transtrade (Spoornet, South Africa)**

- C R. von Gericke, Technical Director
- C G. Liebenberg, Technical Manager

**ABB Transportation (UK)**



C I. White, Manager - Overseas Projects

**Crown Agents (UK)**

C J. Wrighton, Manager - Rail Division

**GEC - Alsthom (UK)**

C S. Ollier, Director - Railway Maintenance Services

**TransNamib (Namibia)**

C C. E. F. Havemann, Senior Manager - Rolling Stock

**The World Bank (Washington, DC)**

C Y. Kedia, Senior Railway Engineer



**ANNEX 4**  
**List of Documents**



**List of Documents**

1. Final Report - Train Operations Improvement Study by De Leuw Cather Int. Ltd., December 1992, USAID
2. Swaziland Railway Draft Corporate Strategy & Business Plan 93/94 - 97/98 by De Leuw Cather Int. Ltd. April 1993.
3. Swaziland Railway Budget 95/96 March 1995
4. Swaziland Railway Budget 94/95 April 1994
5. Review of USAID Rail project Short term Technical Assistance Studies 1990 - 1993 by J R Avery, Consultant for Chief Executive Officer SR.
6. RRSS Project 690 - 0247 Final Evaluation Report - Swaziland Component by Nathan Assoc. Inc. and Burlington Northern Railroad for USAID April 1994
7. Spoornet - Memorandum of Agreement November 1993
8. Swaziland Railways - Annual Report and Accounts 1992/93, 1993/94.
9. Swaziland Railway - Profit Forecast Scenarios:1996-2001 by Coopers & Lybrand, March 1995.
10. Swaziland Railway Technical Assistance - Report in Respect of Accident Reserve Fund and Dividend Policy by Price Waterhouse, November 1993
11. Updating of Swaziland Railway Traffic Costing System: Cost Development Manual and Spread Sheets. T.L. Kennedy. De Leuw Cather International March 17, 1994



**ANNEX 5**  
**Draft Prospectus**



*The following is not intended to recommend a particular course of action to Swaziland Railway, but is provided to demonstrate the basic form and content of a prospectus. Preparation of an actual prospectus document for distribution to potential investors and/or service providers requires certain key decisions to be made with respect to the exact terms (e.g., products, services and financing) of the solicitation.*

**Swaziland Railway  
Sample Prospectus**

**I. Description of Project**

Swaziland Railway (SR) is a government-owned freight railway line established in 1964. SR carries roughly 4 million metric tons of freight annually, three-quarters of which is transit traffic to and from Durban and Richards Bay through Swaziland. SR had assets of E114.3 million as of March 31, 1994 and revenue of E72 million in 1994. SR had a profit of E10 million in 1994. The Chairman of the Board is B.A.G. Fitz-Patrick. Mr. G.J. Mahlalela has been the Chief Executive Officer since April, 1993. SR has 718 employees.

SR is seeking long-term financing to purchase seventeen used mainline locomotives and two used trip locomotives. SR will also negotiate a long-term maintenance agreement which could include financing to up-grade SR's present maintenance facilities. Presently SR leases locomotives from Spoornet, the South African Railway. Spoornet is responsible for all maintenance and overhaul of the locomotives except for routine servicing of Class 34 locomotives, which is presently done by SR.

SR will proceed with the purchase of locomotives if the Government of Swaziland can successfully negotiate a long term traffic agreement with Spoornet. SR will investigate a lease with an option to purchase should insufficient financing at attractive terms be available for immediate purchase. Maintenance can be done at SR's facilities or elsewhere with maintenance at SR facilities preferred. Investments to upgrade SR maintenance facilities will be the responsibility of the successful bidder.

**II. Purpose of the Financing**

SR currently leases four Class 34 locomotives on a daily basis for Export-Import trade of about 1 million metric tons per year. SR also leases an average of six Class 37 locomotives on an hourly basis for transit trade of roughly 3 million metric tons per year. Mainline locomotives are now used for



shunting and tripping. SR intends to purchase two used trip locomotives in order to increase the utilization of its mainline locomotives for carrying freight. SR's Board of Directors has decided that it would prefer to purchase its own locomotives rather than to continue to lease them from Spoornet. The cost of purchasing these locomotives is estimated at about US\$17 million. The investment cost for upgrading the maintenance facilities is estimated at US\$1.8 million, including a 10% contingency. Because SR's experience in maintaining its own locomotives is limited to date, ten Class 37, seven Class 34 and two trip locomotives must be purchased to assure 80% availability. If suppliers believe they can satisfy the projected freight demand with fewer locomotives, SR would consider such bids. SR plans to negotiate a five year maintenance agreement which would provide a guarantee of 80% availability. SR estimates that the maintenance contract, including spare parts, will cost approximately \$1 million per year with the 80% guarantee, and can be included in the price of locomotives or priced separately by bidders.

### **III. Investments**

SR will make the following investments:

- C Ten (10) model GT26M2C 2911 hp or equivalent locomotives
- C Seven (7 ) model GT26MC 2600 hp or equivalent locomotives
- C Two (2) 1000 hp Bo-Bo or equivalent trip locomotives

All equipment must be general overhaul standard.

SR estimates that the cost of upgrading its own maintenance facilities in order to undertake locomotive overhauls in-house within five (5) years is \$1.8 million US. Requirements include:

- C wheel lathe for tire turning
- C small machine tools (pedestal drills, lathes)
- C hydraulic jacks for bogie lifting and TM replacements
- C 2x10T overhead cranes for power unit removal
- C laboratory and testing equipment (spectrographic oil analysis, fuel injectors, pump testing and calibration, governor testing etc)
- C construction of new storage for inventory

### **IV. Terms**



SR is seeking US\$8.5 million, at no less than a 15-year term credit and a rate not to exceed 10% simple interest. The Government of Swaziland will provide a guarantee for repayment and will assume any foreign exchange risk. Suppliers of locomotives are requested to submit a financing package with their offers of locomotives.

The purchase of the locomotives will be awarded on a competitive bid basis. SR expects offers from the government-owned railway companies in South Africa, Namibia, Zimbabwe, Malawi and Zambia in addition to major international locomotives suppliers, such as GE, ABB and GM.

## **V. Impact on SR**

As a matter of policy SR has been commercializing its operations since 1989. The staff has been reduced by almost 40% since 1989. On February 23, 1994, the Government of Swaziland converted much of its debt in SR to equity, improving the strength of SR's balance sheet significantly as well as SR's interest coverage.

In order to meet demand in the year 2000 based on projections prepared jointly by SR and Coopers & Lybrand, SR must purchase 19 locomotives at an estimated cost of US\$17 million. The impact of SR paying cash for 50% of the purchase price and borrowing for the balance is to double SR's assets and reduce its interest rate coverage. Although continuing to lease locomotives would appear a lower cost option to meet projected demand in most cases, SR's Board feels that self-sufficiency in locomotives is essential.

The impact of purchasing used locomotives and contracting out the maintenance on SR's cash flow as compared to leasing is presented in Table 1(attached). Based on the assumptions stated, the IRR of the savings by purchasing rather than leasing locomotives is 13.8% and the pay back is 12 years. The IRR will increase if bidders can meet the forecast demand with less than seventeen mainline locomotives and two trip locomotives, can offer terms better than 15 years at 10% simple interest for general overhaul standard used locomotives, and can perform the required maintenance, including spare parts supply, for less than US\$1 million per year. Annex I provides the [current year] audited financial statements of SR.



## **VI. Submission of Offers**

Offers should be submitted to:

Swaziland Railway  
[address]

no later than [date]. A deposit in the amount of 10% of the offer should be sent to an interest bearing escrow account in the name of Swaziland Railway at:

Barclays Bank  
[address]

Deposits will be returned to unsuccessful bidders.

Detail specifications of the equipment requested can be obtained by writing from:

Swaziland Railways  
[address]

## **VII. Evaluation Criteria**

Awards will be made on the basis of:

- C Price and warranties ( 60%)
- C Maintenance program: investment, annual cost, guarantee and training of SR staff (30%)
- C Financing terms (10%)

Swaziland Railways will hold a pre-bidding conference on [date] at [time]. Qualified suppliers are welcome to tour the facilities and meet with the management and employees of the Company at that time.

## **Annex I**



***Financial Appraisal of Locomotive Lease-Purchase Options for Swaziland Railways***

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Swaziland Railway, [current year] Audited Financial Statements

